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APPLICATION NUMBER: *60/553,104*
FILING DATE: *March 15, 2004*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

P. SWAIN
Certifying Officer

PROVISIONAL APPLICATION FOR PATENT COVER SHEET
This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. **EV437642834US**

INVENTOR(S)

Given Name (first and middle [if any]	Family Name or Surname	Residence (City and either State or Foreign Country)
Mike	Brobston	Allen, Texas

Additional inventors are being named on the _____1_____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (500 characters max)

COMMON RADIO ARCHITECTURE FOR MULTI-MODE/MULTI-BAND APPLICATIONS

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

[✔] Customer Number: **23990**

OR

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ENCLOSED APPLICATION PARTS (check all that apply)

[✔] Specification *Number of Pages* 3

[✔] Drawing(s) *Number of Sheets* 3

[ ] Application Date Sheet. See 37 CFR 1.76

[ ] CD(s), Number _____

[✔] Other (specify) Certificate of Mailing By Express Mail; Fee Transmittal for FY 2004 (in duplicate); postcard receipt

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

[ ] Applicant claims small entity status. See 37 CFR 1.27.

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FILING FEE Amount ($)

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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[ ] Yes, the name of the U.S. Government agency and the Government contract number are: _____

[Page 1 of 2]

Respectfully submitted,

SIGNATURE _John T. Mockler_ (signature)

TYPED or PRINTED NAME ___John T. Mockler___

TELEPHONE __972-628-3600__

Date __March 15, 2004__

REGISTRATION NO. __39,775__
(if appropriate)

Docket Number: 2004.03.007.WS0

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

PROVISIONAL APPLICATION COVER SHEET
Additional Page

Docket Number	2004.03.007.WS0

INVENTOR(S)/APPLICANT(S)

Given Name (first and middle [if any])	Family or Surname	Residence (City and either State or Foreign Country)
Seong Eun Steven	Kim Loh	Plano, Texas Plano, Texas

[Page 2 of 2]

Number _____1_____ of_____1_____

FEE TRANSMITTAL
for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 160.00

Complete if Known

Application Number	
Filing Date	
First Named Inventor	Mike Brobston
Examiner Name	
Art Unit	
Attorney Docket No.	2004.03.007.WS0

METHOD OF PAYMENT *(check all that apply)*

☑ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☑ Deposit Account:

Deposit Account Number	50-0208
Deposit Account Name	Davis Munck, P.C.

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	160.00
				SUBTOTAL (1)	($) 160.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims		Fee from below	Fee Paid
Total Claims	☐	-20** = ☐	X ☐	= ☐
Independent Claims	☐	-3** = ☐	X ☐	= ☐
Multiple Dependent			☐	= ☐

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($) 0

**or number previously paid, if greater; For Reissues, see above*

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Fee ($)	Small Entity Fee Code	Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
.1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 0

SUBMITTED BY

(Complete (if applicable))

Name (Print/Type)	John T. Mockler	Registration No. (Attorney/Agent)	39,775	Telephone	972-628-3600
Signature	*John T. Mockler*			Date	March 15, 2004

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: :   MIKE BROBSTON, ET AL

For   :   COMMON RADIO ARCHITECTURE FOR MULTI-MODE/MULTI-BAND APPLICAITONS

MAIL STOP PROVISIONAL PATENT APPLICATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

CERTIFICATE OF MAILING BY POST OFFICE EXPRESS MAIL

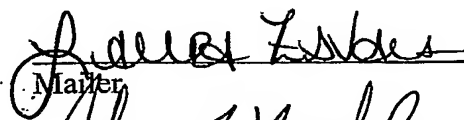The undersigned hereby certifies that the following documents:

1.   Postcard receipt;
2.   Check in the amount of $160.00 for the provisional patent application filing fee;
3.   Fee Transmittal for FY 2004 (in duplicate);
4.   Provisional Application for Patent Cover Sheet (in duplicate);
5.   Specification (3 pages); and
6.   Drawings (3 pages)

relating to the above application, were deposited as "Express Mail", Mailing Label No. EV437642834US with the United States Postal Service, addressed to: Mail Stop Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on March 15, 2004.

Date: 3/15/04

Date: 15 March 2004

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NVENTION TITLE Common Radio Architecture for Multi-mode / Multi-band Applications

DESCRIPTION OF THE INVENTION

'his description should be written in the Inventor's own words and should follow this guideline:

- **General purpose of the invention. State in general terms or summarize what the objectives of the inventions are.**
  The proliferation of wireless access standards proves to be inconvenient and challenging for wireless terminal manufacturers. Further, end user expectations of a ubiquitous network cannot be met with terminals that support only a subset of the possible standards. In response, wireless systems are transitioning to the concept of a Software Defined Radio (SDR) to provide common hardware platforms for multiple air technologies. This SDR concept taking in mind its applications in handset / mobile terminals environment has to take into consideration factors like current consumption as well as lower component count to conserve board space. At the same time, it is the intention to achieve roaming among the supported standards and this challenges the SDR receiver to facilitate faster searches and handoffs.

Through continual advancement of semiconductor process technology, an increasingly greater percentage of these signal processing functions may be performed in reconfigurable hardware such as field programmable gate arrays (FPGAs) since these devices are capable of performing digital signal processing (DSP) functions at very high speed while consuming lower power than a traditional DSP processor. However, the current consumption does vary proportionately with the processing speed and to further reduce the power consumption of the SDR, this invention proposed a Near Zero-IF (NZIF) RF receiver frontend configuration to achieve a lower IF frequency and reducing the processing rate of the Digital IF (DIF) receiver.

The below described invention provides a method for achieving a lower sampling rate at IF by means of a NZIF RF receiver, while maintaining the Digital Signal Processing functions at IF. Further, typical embodiments of the design are discussed for clarity.

- **Description of the invention in detail (Including its operation, purpose, environment and how problems are solved).**
  he invention disclosed by this form puts in place a design that provides signal processing hardware up to IF frequency in a wireless rminal receiver that may be reconfigured to cater for multi-mode operations and a RF receiver frontend that performs a Near Zero IF wn conversion using a broadband image reject downconverter. This invention also allows the implementation of a dual identical ceiver for more efficient searching algorithm to facilitate roaming. Thus, as a user travels to regions that support varied wireless andards the same terminal can be used. The twin receiver architecture also permits remote reconfiguration of the IF filter and the IF.

gure 1 illustrates a high level view of a wireless terminal. The Processor and Modem block are typically general purpose or semi-stom devices that can essentially change characteristics based on a new software load. It describes a broadband RF image reject wnconverter that caters for multi-band operations bringing the input signal to near zero IF frequency to a configurable anti-alias ter before the ADC.

gures 2 presents the 3 broadband LNAs and selection switches base on the band of operation or search as well as an IF frequency an with image rejection coming solely from the broadband mixer. Figure 3 describes the IF variable gain amplifier with both nfigurable BPF blocking filter and BPF anti-aliasing filter.

he general process can be illustrated with the example described hereafter. A PCS signal at the antenna will be selectively routed to 1800MHz ~ 1900MHz band switchable gain LNA for signal amplification. A single image reject broadband mixer will wnconvert the signal to an IF frequency of 10MHz. It will pass through a configurable Band Pass Filter (BFP) to remove erferers. A variable gain amplifier will adjust the signal to an optimized predetermined level for the ADC after another

The invention described in this invention disclosure is hereby submitted under my employment agreement with Samsung Telecommunications America, L.P..			
nventors Full Signature	Date	Inventors Full Signature	Date

Inventor(s): Submit to Jonathan E. Smith, Phone (972) 761-7608, Fax (972) 761-7601
The *inventor(s)* shall *sign* and *date each page* of the invention disclosure and any *drawings.*

ention Disclosure Form – Rev August 2003   Confidential and Proprietary Information   2 of 6

configurable anti-alias BFP. The ADC can sample the signal at 40 MSps.

With the example embodiment and procedure described below, the disclosed invention achieves a multi-band, multi-mode receiver with optimize current requirement that is remote configurable, and capable of searching by signal strength measurements.

A primary feature of the invention is the use of a broadband NZIF RF receiver to achieve a low sample rate DIF design for current conservation. It is achieved using configurable BPF for necessary blocking and anti-aliasing functions. The image reject broadband high linearity mixer is a critical block in the RF design. This novel architecture allows the receiver to perform DSP functions like RSSI measurement for searching while optimizing the current.

An example receiver procedure for the wireless terminal in search mode:

a) Base on an established search algorithm, the appropriate band LNA is selected via the switchplexer.
b) The appropriate switch is activated to connect the single broadband image reject mixer to the selected LNA.
c) The synthesizer sweeps through the channels for the band.
d) The blocking BPF is configured through the score of predetermined channel bandwidths.
e) Digital IF section reconfigures base on each mode such as GSM/GPRS/EDGE, CDMA, WCDMA, 802.11.
f) The RSSI is determined after the Digital Channel Filter.
g) Once determined that the signal strength exceeds the signal engaged at the primary receiver, the synthesizer is locked on to this channel.
h) Modem performs mode identification and reconfiguring the anti-alias BPF.

3. **Describe the prior art, method or performance, of the invention (Including any related publicly available documentation, such as journal articles or patents).**
In the current state of the art, there are no known combinations of a NZIF RF with a DIF receiver. The lack of such prior art motivates the development of this combination platform. For instance, the state of wireless terminal development has been such that differing wireless standards required different hardware, and that the implementation of conventional Analog-to-Digital at higher frequencies for a configurable hardware proof too taxing on the current consumption budget.

Current design uses a ZIF platform that has the entire receiver frontend in analog. This configuration makes it impractical for the receiver to measure the receive signal strength that the baseband modem can use. Also, the direct downconverter designed in today's ZIF architecture is narrowband. Other intentions seek to digitize at RF frequency, which will also means higher current requirements. Therefore, a prime focus of the disclosed invention is to exploit the broad bandwidth image reject mixer design of the RF analog frontend to cater for multiple bands at lower current consumption, as well as the configurability of the IF filters and the digital IF operating at lower sampling rate and therefore lower current consumption.

What are the potential applications and/or markets for this invention?
Multi-mode and Multi-band Wireless Applications

What are the features that are believed to be new, novel and non-obvious?
A SDR terminal capable of providing wireless service in areas of varied air technologies with little or no network intervention. To that end the specifics required follow.

1) Wireless terminal whereby IF signal processing is performed with reconfigurable blocking and anti-aliasing filters.
2) Using a Near Zero-IF broadband RF to meet low processing rate of the Digital IF for low current consumption.

3) A single broadband image reject mixer to drastically reduce external filters, and I/Os of ASIC resulting in an optimize package and die size.

4) Rf supports multi-band, and SDR supports multi-mode.

ketches, prints, photos and other illustrations, as well as reports of any nature in which the invention is referred to, if vailable, should form the basis of the disclosure and reference can be made in the description of the construction and peration of the invention.

The invention described in this invention disclosure is hereby submitted under my employment agreement with Samsung Telecommunications America, L.P..			
nventors Full Signature	Date	Inventors Full Signature	Date

Inventor(s): Submit to Jonathan E. Smith, Phone (972) 761-7608, Fax (972) 761-7601
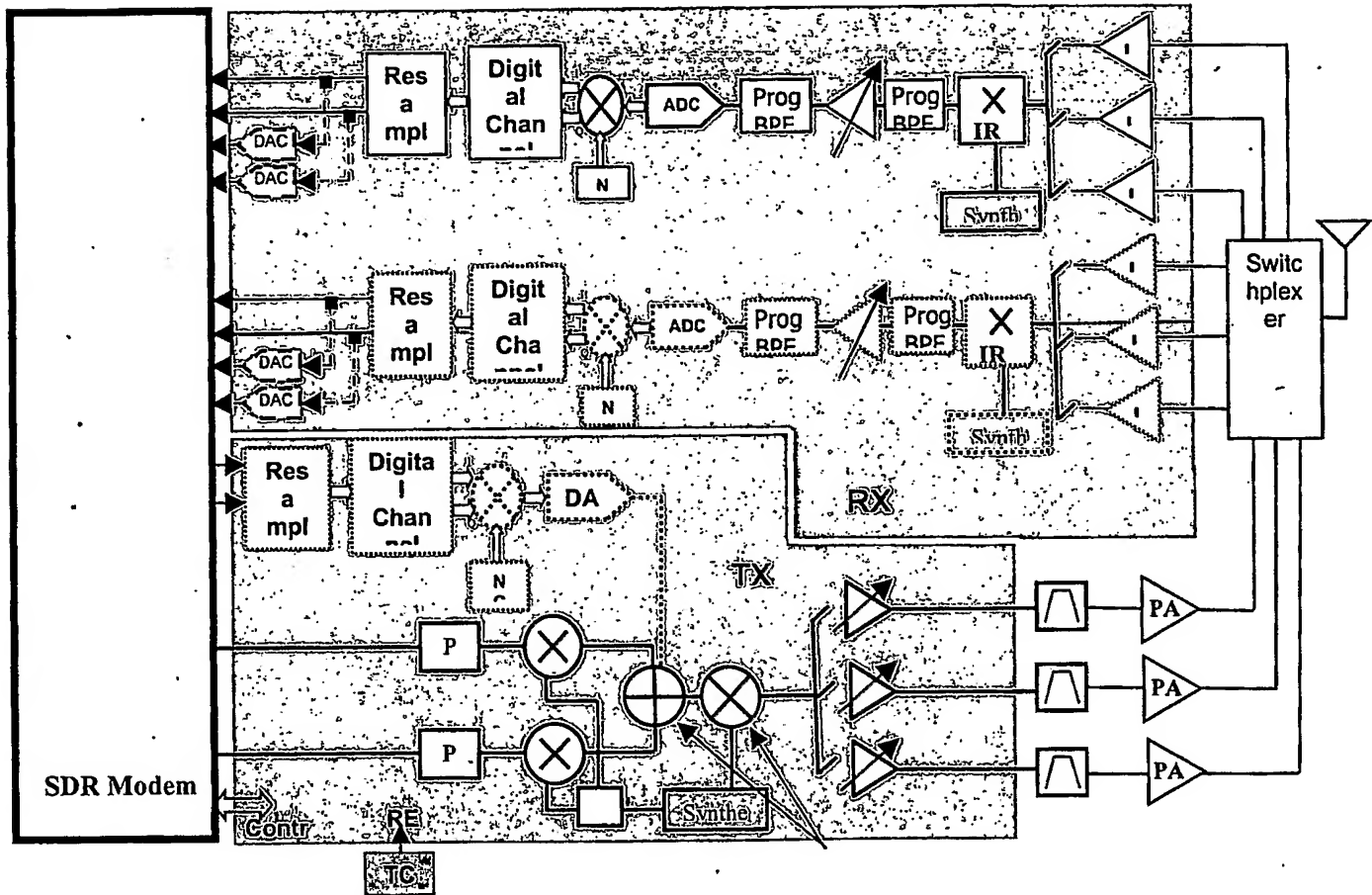The *inventor(s)* shall *sign* and *date each page* of the invention disclosure and any *drawings.*
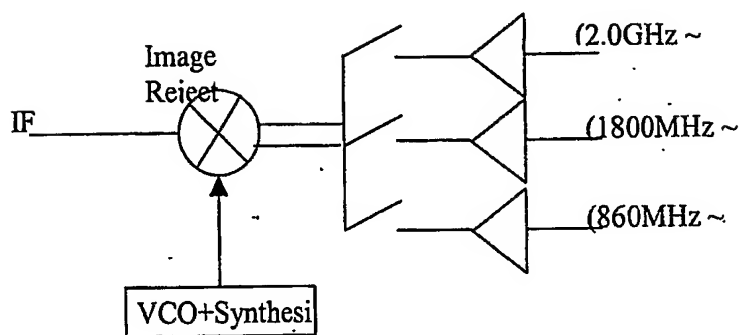
FIGURE 1

Typical Terminal Functionality

FIGURE 2

Broadband LNA and Image
Reject Mixer

Configurab...

Configurab...

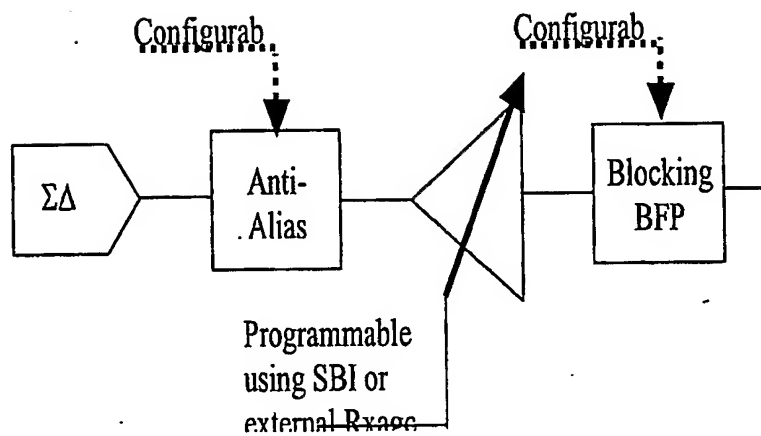ΣΔ

Anti-
. Alias

Blocking
BFP

Programmable
using SBI or
external Rxagc

FIGURE 3

IF Variable Gain Amplifier
and Configurable BPF